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Feasibility study: Pathway to autonomy for an SME factory

Project team

University of Portsmouth

University of Sheffield

Hongjie Ma	David Brown	Hui Yu	Ann Swift	Ruby Hughes
Algorithms	Industry Systems	Image Processing	Future funding	DES Modelling

Project timeframe

Start: 2nd April 2018
End: 31st March 2019

Contact

Hongjie Ma
University of Portsmouth

hongjie.ma@port.ac.uk

Industry partner

KCC Ltd

What does the project demonstrate?

The aim of the project is to develop a working demonstrator of a general purpose Advanced Abnormal Perception system (AAP) for SME factories with automated production. This would show the potential of integrating existing AAP technologies with machine learning, to provide a low-cost means of improving an SME factory's production line efficiency, quality control and maintenance.

Advanced Abnormal Perception system for the autonomous factory

A fully autonomous factory operates without humans. While this scenario promises increased productivity, it may also introduce increased risks; system failures and risks are currently often identified by the presence of experienced workers. In response to this concern, many Advanced Abnormal Perception (AAP) systems have been developed. Such a system automatically recognises when things are going wrong; it monitors and deals with (as far as possible) faults in the production process and quality control of the product. Thus far, these systems have been developed only for a specific manufacturing process and lack versatility beyond this. The ideal AAP system should be application independent, which means that it should, firstly, be a self-learning system, which is able to select site-appropriate features, and secondly, use measuring instruments, which don't interfere with the production line.

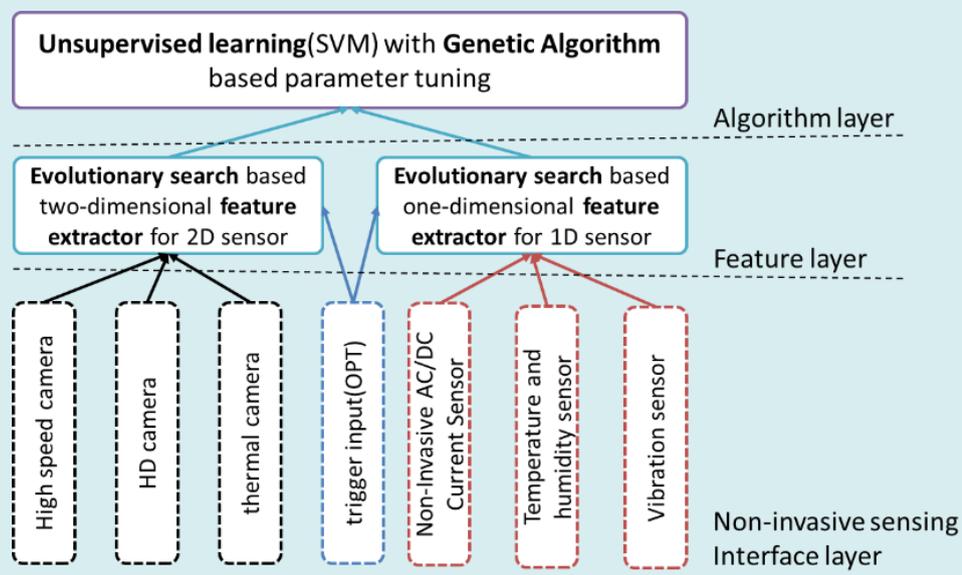## Towards a generic Plug and Play AAP system

The project's industrial partner, KCC Ltd, is a leading player in environmental packaging. They have developed a carbon friendly and sustainable ready-meal tray. Given the current problem of plastics polluting the oceans, KCC Ltd

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can expect a surge in demand for their products. This will bring the opportunity for expansion, but also challenges around maintenance costs and quality control. The generic AAP system to be developed here, will have features that allow it to be used by any SME ('Plug and Play'). It will:
a) be a self-learning system, adjusting to any system without manual input (see picture below)
b) acquire data via many and varied sensors (e.g. high-speed cameras, vibration, electrical current), which do not interfere with the production process.

The generic AAP system will be tested and validated on KCC's production line for environmental ready-meal trays. The results will be used to produce a model to quantify the impact of the AAP system on an SME.

Architecture of a generic AAP system

The project is the first to develop an Artificial Intelligence-based "Plug and Play Advanced Abnormal Perception Technology", which could be deployed with low initial investment and installation costs. This would provide an SME with real-time monitoring of the production line and product quality.

Wider applications

The 'Plug and Play' AAP system could be made widely available across any industrial sectors that are moving towards autonomous manufacturing.

Next steps

Further research will allow improvements to be made in how the AAP system operates in conjunction with other systems, such as the production line control system and production line monitoring system.